

TECH-TOPICS

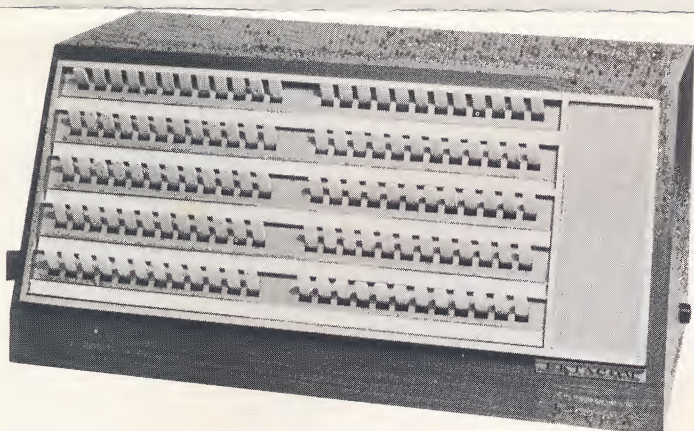
Reporting On the Advance Application of Switches, Jacks, Plugs, Molded Cable Assemblies & Audio Connectors

5555 Elston Avenue **SWITCHCRAFT** Chicago, Illinois 60630

TWO APPROACHES TO INTERCOM SWITCHING

The two distinctive intercoms shown on this page illustrate that there is more than one way to do a job. The job we are referring to is switching. In the Fisher-Berkely Ektacom Series of intercoms, non-illuminated lever switches with customized frames and lever tabs, were selected. The Rich-Andix intercom system, designed primarily for hospitals, employs Series 27000 "Lever-Lite"

Switches. Although both these switch series use the Switchcraft stack switch assembly, one manufacturer chose an illuminated switch, the other decided upon a non-illuminated one. For more information on the switches used in these applications, write for Catalogs No. S-307 and S-309.



The Fisher-Berkely Ektacom transistorized intercom.

When the Fisher-Berkely Corporation commenced design work on their Ektacom transistorized intercoms, they were determined that only the finest quality components would be used. Military type wrapped solder joints are used throughout and many other design innovations have been incorporated into the circuit. Transistors—conservatively operated—are used in the output stage for instant power and cool operation.

In surveying the market for switches, Fisher-Berkely found that a multiple lever switch assembly similar to the Switchcraft MLK Series Lever Switch offered all the features desired. MLK Series switches have long been recognized as ideal for intercommunication switching and have been used successfully in control panels in military equipment and in language laboratory control consoles.

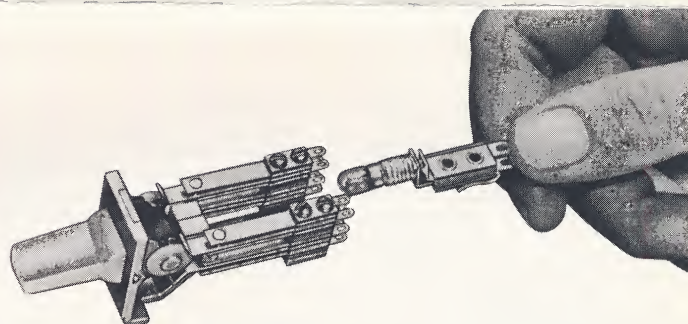
They offer such desired features as a rugged heavy duty, one-piece frame, fast-simple mounting, a variety of multiple circuitry and choice of contact materials. In addition, this rugged, short frame lever switch requires only 1-15/16" depth behind the mounting panel.

For this particular application, however, Fisher-Berkely desired a larger actuating lever than is normally supplied with the MLK Series, plus a special

frame of their own design and manufacture. Under the circumstances, the stack switch assemblies were provided to Fisher-Berkely, where they were assembled and mounted to the special frames.

Another important consideration studied by Fisher-Berkely was the assumption by many that all intercommunications equipment is inherently noisy or develops noise with age. Over the years great strides have been made toward lowering this noise through the use of silver, and more recently, palladium contacts. But Fisher-Berkely went one step beyond. To insure dependable, quiet, noise free operation the company specified the quietest (and most costly) switching material known to the art... gold.

The Rich Engineering Company has developed many hospital intercommunications systems, designed to provide rapid communications between patients and staff members. A modern communications system is an asset no modern hospital can afford to be without. The Andix Master Station introduces an outstanding departure from conventional dial selector and rotary switch type systems in that it features a touch selector bank of ten buttons to enable faster, more accurate room selection.



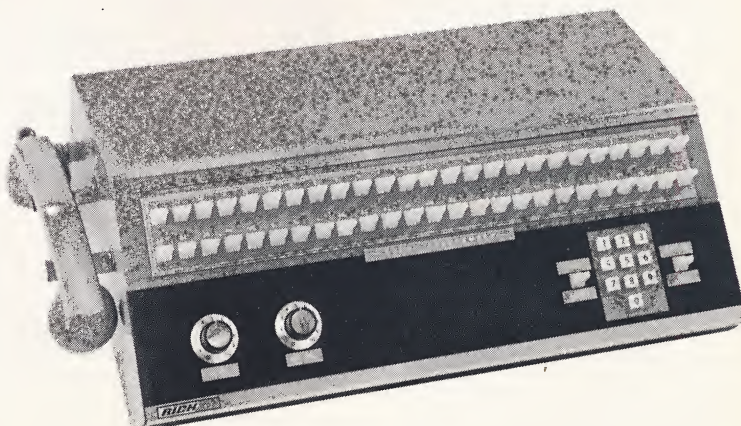
Series 27000 "Lever-Lite" Switch with three color illumination.

Fifty Series 27000 Switchcraft "Lever-Lite" Switches are used in the Andix Intercommunication exchange. These switches were chosen partly because of their unique lighting circuit—which permits three separate colors to be illuminated; one for each switch position—and partly because of their new contoured extra large levers. In the center or neutral position the light is used as a room annunciator lamp to alert the operator that a call has been made. A chime tone is sounded so that audible as well as visual indication is given.

The Switchcraft Series 27000 "Lever-Lite" used in the An-

dix system utilizes a stack assembly with nickel silver springs and fine silver contacts. Current rating is 3 amperes, 300 watts maximum, A.C., non-inductive load. (Palladium contacts for low current, low voltage circuits are also available on special order.)

Among the outstanding features of the Series 27000 is the use of long springs without any forms at the point of flexing, which helps ensure exceptionally long spring life. Also, lamps for the switches are mounted in a "snap-out" assembly, which permits lamp replacement in less than a minute.



Fifty Series 27000 "Lever-Lite" Switches are used in the Rich Andix automatic nurses digital intercommunication exchange. The center position of the illuminated switch serves as a call annunciator.

WHEN SPECIAL BUTTON SYMBOL IS DESIRED CONSIDER VARIETY OFFERED BY CUSTOM ENGRAVING

The solid-state noise figure meter shown in the photo on the right is a unique example of Switchcraft's ability to modify standard stock items to suit a particular manufacturer's requirements. In this particular instance the equipment manufacturer, General Microwave Corp., specified custom engraved buttons when placing their order.

Standard characters A-Z, 0-999 or any combination of these are available on an immediate delivery basis since engraving tools are already available for these most commonly used characters. However, in the case of General Microwave's Noise Figure Meter, a few additional symbols were requested. Among these were db. (for decibels) and the accepted mathematical symbol for infinity. These special engraved buttons were supplied at an additional nominal charge, with no difficulty as is usual in situations where custom engraving is desired.

Our first recommendation to anyone who might want a custom engraved button is to specify whether an illuminated or non-illuminated type is to be used. Both types of buttons can be engraved effectively, so the choice is up to the design engineer.

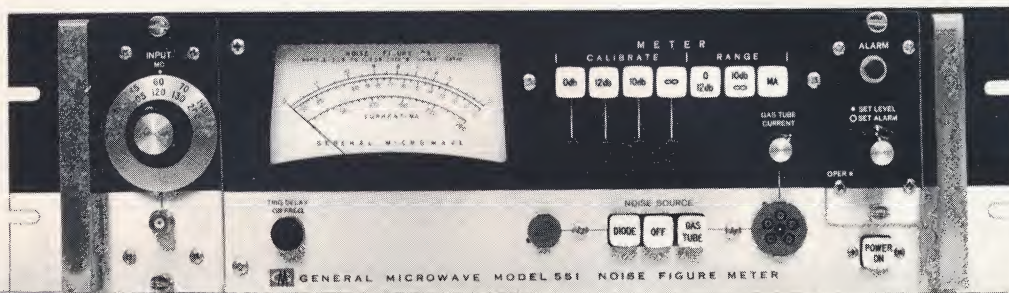
If an illuminated button is being considered, the design engineer should specify the color he desires in the display screen or jewel which is the

face of the button and also the color fill he desires. With non-illuminated buttons, the color of the button should be specified, as well as the color fill, remembering that black is usually the recommended color fill for light-colored buttons and a white, yellow or green color fill for dark-colored buttons.

Upon receipt of the manufacturer's engraving specifications, a check is made of the master plate file to determine if the symbol has been used before. If it has, the overall cost of engraving can be reduced still further from its normal low amount. If the symbol has never been requested, then a mas-

Non-illuminated buttons which can be effectively engraved include the Series 550, 590, A-590 and 600 used on Series 7000, 8000 and 35000 "Multi-Switches."

In addition to the buttons mentioned above, engraving can also be provided on illuminated buttons such as the Series 585,



Next, the design engineer should include a sketch of the symbol required and an indication of the size he desires the symbol to be. The standard height for engraved letters and symbols is 1/8" and generally no more than five symbols may be placed on each line. Two lines of characters are the maximum possible under average conditions. Should deviations from these standards be desired, consultation is recommended to determine if some of the many variables involved in engraving may be applied to solve the problem.

ter plate must be made; however, the cost of this is very low.

The actual engraving process is fairly direct and involves the cutting of the button face with the required die and the subsequent filling in of the cut with color.

(the type used on the General Microwave Noise Figure Meter) and on the 400 Series button used on the 36000, 37000 and 38000 little "Multi-Switch." For a graphic guide to standard buttons that may be engraved, see Table I on this page.

NEOPRENE JACKET FOUND BEST FOR COILED CORDS

The jacket surrounding a cable serves one main purpose, protection: protection from chemicals, weather, temperature and physical abuse. But when it comes to coiled cords the jacket material takes on the added responsibility for withstanding constant stress and strain from stretching and recoil. Generally, coiled cords are jacketed in either Neoprene or Polyvinylchloride (PVC), both recognized for their flexibility. But which is the best choice?

Due to PVC's poor "memory" its use as a jacket covering for coiled cords, while economical, is not very practical from the standpoint of reliability. Under certain ambient temperature conditions, PVC coiled cords will stretch beyond their limitations and will become permanently deformed. Additionally, if the cable stretches far enough the wire will fracture and break.

Neoprene which has an outstanding "memory," is an oil resistant synthetic rubber which additionally has an excellent resistance to abrasions of all kinds. Several of Neoprene's outstanding advantages, as far as coiled cords are concerned, are listed.

1. Better snap or retractile properties.
2. Better memory or less tendency to loose retractile properties, especially when fully stretched.
3. Better low temperature flexibility.
4. No elongation of coil at elevated temperatures.
5. Relatively constant retractile properties at both high and low temperatures.
6. No deformation of compound due to heat or pressure.
7. Less chance of crushing, cut-through, abrasion and melting when touched with a hot object.

The two most important items listed above are numbers one and two. A coiled cord is designed to stretch under all conditions and yet it must be able to retract to its original size quickly and without permanent deformation.

It is our engineering department's firm belief that the few extra pennies involved in using Neoprene coiled cord covers, in lieu of PVC, is well worth it in terms of greater reliability and longer life. For more information on coiled cords, write for Catalog No. M-701.

TABLE I
Guide to Standard Buttons Suitable for Engraving
Button Series For Use on the Following Switch Series:

Non-illuminated		550	All designed for use on 7000, 8000 and 35000 "Multi-Switches"
		590	
		A-590	
		600	
Illuminated		B-590	Series 8000 "Multi-Switch"
		585	Series 21000 "Multi-Switch"
		400	Series 36,000, 37000, 38000 little "Multi-Switch"

PRODUCT APPLICATIONS

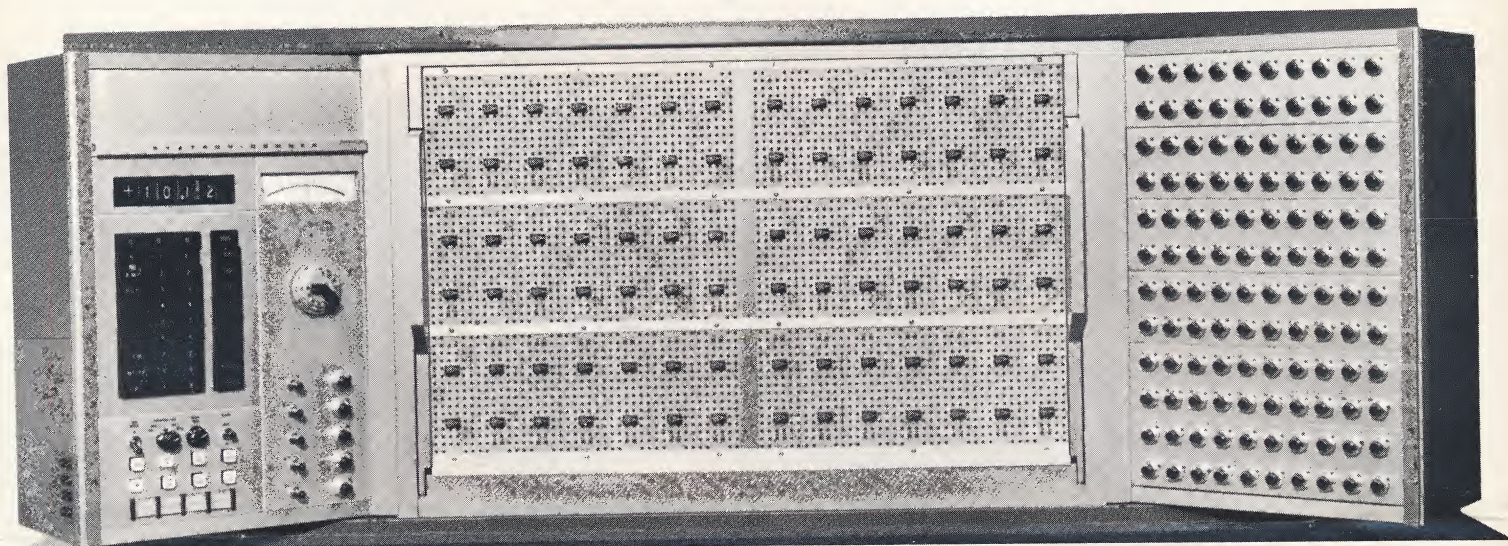
The field of switches, plugs and audio connectors has often been neglected as far as product application goes. If you have designed an interesting system which uses Switchcraft products in any way, please let us know.

We hope you enjoy reading Tech-Topics. Should you know of others within your organiza-

tion who would be interested in this application newspaper, please send us their name and address. We will be pleased to add them to our mailing list. Comments and suggestions should be sent to:

Tech-Topics, Switchcraft, Inc.
5555 North Elston Avenue
Chicago, Illinois 60630

SYSTRON-DONNER ANALOG COMPUTER FEATURES FUNCTIONAL CONTROL WING FOR EASE OF OPERATION



Shown above is the Systron-Donner SD80 Analog Computer. A unit of such advanced design that it can be operated by unskilled personnel. Switchcraft Series 3000 and 21000 switches can be seen on the left hand control panel.

All the sophisticated operator controls and conveniences normally found only in computation center machines are now available in a new desk top, solid state, 100 volt Analog computer built by Systron-Donner Corporation. This highly compact computer is designed to assist the engineer, scientist and researcher in programming and solving everyday problems, and thus eliminate the need for operator specialists.

The basic SD80 Analog computer has a capacity of 84 operational amplifiers for versatility; modular plug-in computing elements, completely tran-

sistorized circuitry, four heavy duty power supplies and centralized controls for problem setup, checking and operation.

The left hand control wing has several features which are specifically designed to make the operator's job easier and more effective.

The clean panel layout is enhanced by the use of eight illuminated Switchcraft Series 21000 single station "Multi-Switches" seen on the lower portion of the left hand panel. Three stations are used to control overload alarm, overload hold and overload reset. Illumination of these switches is

of prime importance to indicate if the computer is functioning normally. Systron-Donner elected to use six white jewels and two colored on the 21000 Series bank. In addition to the 21000 Series pushbuttons, Systron-Donner engineers specified two Switchcraft Series 3000 "Lev-R Switches" to control the computation time and remote or slave operation options.

The Series 3000 switch is an unusually small, lever action unit. Available in locking and non-locking types, additional features include single mounting hole, long lasting springs and fine silver contacts rated

at 3 amperes, 300 watts maximum, A.C., non-inductive load. A wide variety of custom modifications can be made, including larger silver contacts for higher currents, and palladium contacts for low current low voltage application. A special Series 3000 switch is available for use in intercoms; locking is provided on one side of neutral and momentary action on the other.

Complete information can be obtained by writing for Catalogs Nos. S-302 and S-306 which provide engineering specifications on the Series 3000 and Series 21000 switches, respectively.

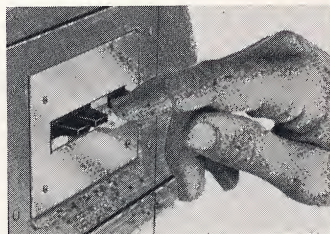
39000 SERIES MULTI-SLIDE SWITCH OFFERS NEW METHOD TO AID SOLVING "HUMAN ENGINEERING" PROBLEMS IN DESIGN OF CONTROL CONSOLES

Multiple switching action, plus interaction between switch stations—advantages heretofore available only with pushbutton switches—are now available in a significantly new Switchcraft slide-action switch.

Called the Series 39000 "Multi-Slide" Switch, the new unit is being introduced at the Switchcraft Exhibit at the Western Electronic Show and Convention in San Francisco.

The new "Multi-Slide" was primarily developed to give design engineers an entirely new switching method with which to solve the "human engineering" problems created by their almost total dependence upon the use of masses of pushbutton switches in the design of complex control consoles. With the "Multi-Slide" Switch, it is now possible to eliminate much of the operating confusion inherent in the constant manipulation of arrays of only pushbuttons. With the "Multi-Slide" Switch, engineers can now lessen operator fatigue and error by designing slide-switching effort into a console without

sacrificing switching versatility or function. Except for providing illuminated status indication, the "Multi-Slide" Switch can be assembled to provide any switching function common to conventional pushbutton switches.



View of the new Series 39000 "Multi-Slide" Switch as it would appear installed on a front panel.

For instance, standard "Multi-Slide" Switches are available in up to 18-station arrays with up to 3 pole, double throw action per station. Additional poles and power switching are available upon special order. Another important similarity to pushbutton multiple switches

is the availability of "Multi-Slide" Switches with the standard functions of interlock and all-lock. As an advantage over pushbutton switches with all-lock function, the slide-to-release action of "Multi-Slide" Switches permits immediate correction of a switching error without cancelling other actuated switches.

"Multi-Slide" Switches are designed to meet the performance requirements of sophisticated equipment, such as, analog computers, analyzers, transmitters and receivers, intercoms, machine and process controls, ground support systems, scientific instruments, and test measurement and instrumentation. In all installations it offers the important advantage of requiring extremely shallow depth-behind-panel mounting space.

Status indication of individual switches is provided by pressure sensitive, colored legend tabs that are easily applied to indented portions of each slidebutton. These legend tabs

are available from stock in five solid colors or hot stamped with various symbols or legends on special order. Standard slidebuttons are available in black with other colors available on special order.

"Multi-Slide" Switch frames are stamped from precision dies, internally keyed for correct alignment to assure smooth action throughout entire life of the switch. Quality molded nylon lifters are used at each station for easier action and longer switch life.

Stack switch modules used at each station utilize special nickel silver springs. Cross bar welded palladium contacts, rated 3 amperes, 300 watts, maximum A.C., non-inductive load are standard. Silver and gold contacts are available on special order. A unique design feature permits removal of the complete stack switch module for each station from the rear of the switch with one screw.

For additional information and technical specifications on the "Multi-Slide" Switch, write for Engineering Bulletin No. 158.

WHEN SPECIAL BUTTON SYMBOL IS DESIRED CONSIDER VARIETY OFFERED BY CUSTOM ENGRAVING

The solid-state noise figure meter shown in the photo on the right is a unique example of Switchcraft's ability to modify standard stock items to suit a particular manufacturer's requirements. In this particular instance the equipment manufacturer, General Microwave Corp., specified custom engraved buttons when placing their order.

Standard characters A-Z, 0-999 or any combination of these are available on an immediate delivery basis since engraving tools are already available for these most commonly used characters. However, in the case of General Microwave's Noise Figure Meter, a few additional symbols were requested. Among these were db. (for decibels) and the accepted mathematical symbol for infinity. These special engraved buttons were supplied at an additional nominal charge, with no difficulty as is usual in situations where custom engraving is desired.

Our first recommendation to anyone who might want a custom engraved button is to specify whether an illuminated or non-illuminated type is to be used. Both types of buttons can be engraved effectively, so the choice is up to the design engineer.

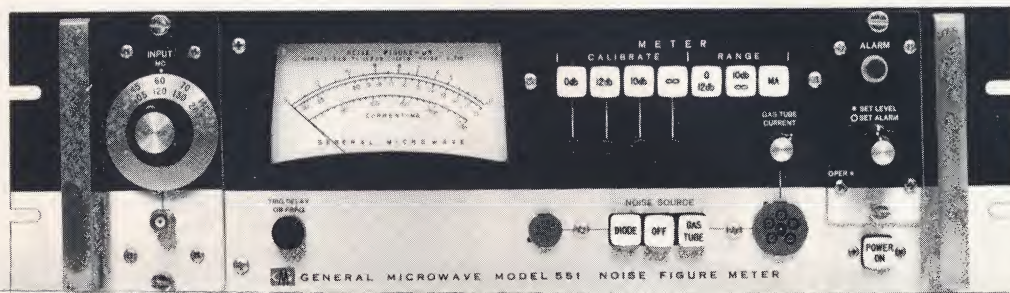
If an illuminated button is being considered, the design engineer should specify the color he desires in the display screen or jewel which is the

face of the button and also the color fill he desires. With non-illuminated buttons, the color of the button should be specified, as well as the color fill, remembering that black is usually the recommended color fill for light-colored buttons and a white, yellow or green color fill for dark-colored buttons.

Upon receipt of the manufacturer's engraving specifications, a check is made of the master plate file to determine if the symbol has been used before. If it has, the overall cost of engraving can be reduced still further from its normal low amount. If the symbol has never been requested, then a mas-

Non-illuminated buttons which can be effectively engraved include the Series 550, 590, A-590 and 600 used on Series 7000, 8000 and 35000 "Multi-Switches."

In addition to the buttons mentioned above, engraving can also be provided on illuminated buttons such as the Series 585,



Next, the design engineer should include a sketch of the symbol required and an indication of the size he desires the symbol to be. The standard height for engraved letters and symbols is 1/8" and generally no more than five symbols may be placed on each line. Two lines of characters are the maximum possible under average conditions. Should deviations from these standards be desired, consultation is recommended to determine if some of the many variables involved in engraving may be applied to solve the problem.

ter plate must be made; however, the cost of this is very low.

The actual engraving process is fairly direct and involves the cutting of the button face with the required die and the subsequent filling in of the cut with color.

(the type used on the General Microwave Noise Figure Meter) and on the 400 Series button used on the 36000, 37000 and 38000 little "Multi-Switch." For a graphic guide to standard buttons that may be engraved, see Table I on this page.

NEOPRENE JACKET FOUND BEST FOR COILED CORDS

The jacket surrounding a cable serves one main purpose, protection: protection from chemicals, weather, temperature and physical abuse. But when it comes to coiled cords the jacket material takes on the added responsibility for withstanding constant stress and strain from stretching and recoil. Generally, coiled cords are jacketed in either Neoprene or Polyvinylchloride (PVC), both recognized for their flexibility. But which is the best choice?

Due to PVC's poor "memory" its use as a jacket covering for coiled cords, while economical, is not very practical from the standpoint of reliability. Under certain ambient temperature conditions, PVC coiled cords will stretch beyond their limitations and will become permanently deformed. Additionally, if the cable stretches far enough the wire will fracture and break.

Neoprene which has an outstanding "memory," is an oil resistant synthetic rubber which additionally has an excellent resistance to abrasions of all kinds. Several of Neoprene's outstanding advantages, as far as coiled cords are concerned, are listed.

1. Better snap or retractile properties.
2. Better memory or less tendency to loose retractile properties, especially when fully stretched.
3. Better low temperature flexibility.
4. No elongation of coil at elevated temperatures.
5. Relatively constant retractile properties at both high and low temperatures.
6. No deformation of compound due to heat or pressure.
7. Less chance of crushing, cut-through, abrasion and melting when touched with a hot object.

The two most important items listed above are numbers one and two. A coiled cord is designed to stretch under all conditions and yet it must be able to retract to its original size quickly and without permanent deformation.

It is our engineering department's firm belief that the few extra pennies involved in using Neoprene coiled cord covers, in lieu of PVC, is well worth it in terms of greater reliability and longer life. For more information on coiled cords, write for Catalog No. M-701.

TABLE I
Guide to Standard Buttons Suitable for Engraving
Button Series For Use on the Following
Switch Series:

Non-illuminated		550	All designed for use on 7000, 8000 and 35000 "Multi-Switches"
		590	
		A-590	
		600	
Illuminated		B-590	Series 8000 "Multi-Switch"
		585	Series 21000 "Multi-Switch"
		400	Series 36,000, 37000, 38000 little "Multi-Switch"

PRODUCT APPLICATIONS

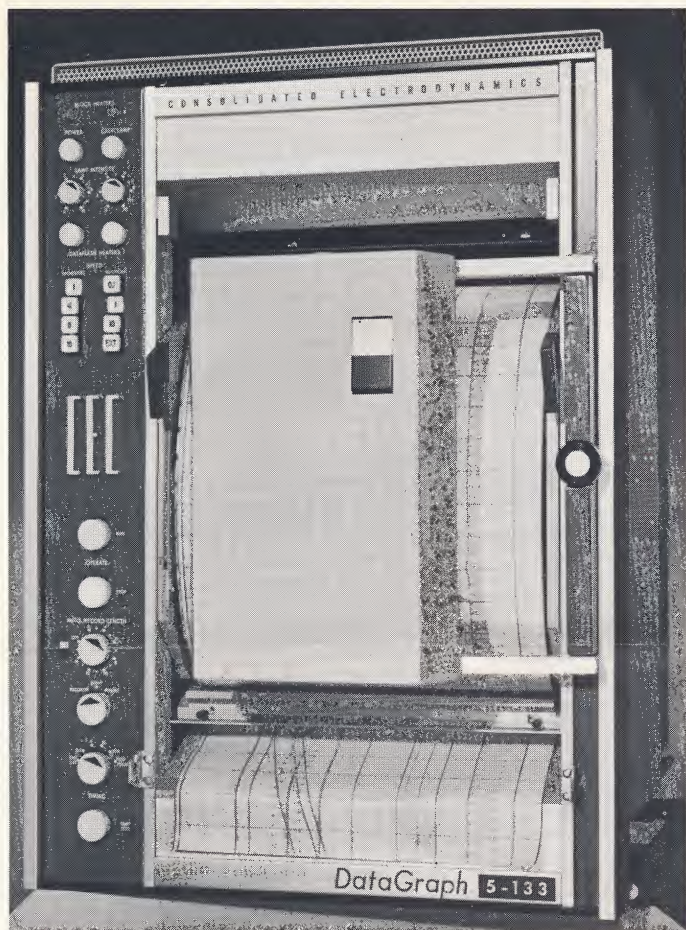
The field of switches, plugs and audio connectors has often been neglected as far as product application goes. If you have designed an interesting system which uses Switchcraft products in any way, please let us know.

We hope you enjoy reading Tech-Topics. Should you know of others within your organiza-

tion who would be interested in this application newspaper, please send us their name and address. We will be pleased to add them to our mailing list. Comments and suggestions should be sent to:

Tech-Topics, Switchcraft, Inc.
5555 North Elston Avenue
Chicago, Illinois 60630

ADVANCED RECORDING OSCILLOGRAPH USES 21000 SERIES "MULTI-SWITCHES"



Type 5-133 CEC recording oscillograph, with Dataflash transport. Two, 4-station Series 21000 "Multi-Switches" which control recording speeds are seen mounted on the upper half of the control panel.

Man's quest for knowledge has carried scientific investigation further forward than any 19th Century soothsayer ever predicted.

Along with the gathering of scientific information a totally new field has opened up; instrumentation and recording. From the sounding of the ocean's deepest depths of Guam to the Ranger Moon Probes, scientific facts must be collected and recorded for later interpretation and study.

One company involved in the design and manufacture of scientific recording instruments is Consolidated Electrodynamics Corporation, a subsidiary of Bell and Howell. This company manufactures an advanced recording instrument, which represents the ultimate achievement in oscillography (the recording of wave forms of changing voltages, currents or any other quantity which can be translated into electrical energy). This highly refined instrument is the CEC Type 5-133 DataGraph Recording Oscillograph, a rack or bench mounted direct writing instrument which can record 36 or 52 channels of data on 12 inch wide light-sensitive paper. To suit all types of data recording the Datagraph is designed with twelve recording speeds: from .1 to 160 i/s.

Recording paper is available in 250 and 475 foot rolls. At the slowest speed of .1 i/s,

with "long play" paper, the CEC 5-133 Oscillograph can record data for over 15 hours.

For the important function of speed control, Switchcraft Series 21000 illuminated "Multi-Switches" were selected by CEC because they offered a perfect combination of illumination, long spring life, modern button design and lockout bar, to prevent activation of more than one button at a time.

In operation one 4-station interlocking Series 21000 "Multi-Switch" is used to select the motor voltages required to achieve the four basic speeds of 1, 4, 8, and 16 i/s. Another 4-station interlocking Series 21000 "Multi-Switch" is used as a speed control multiplier to permit speeds as slow as .1 i/s, or as fast as 160 i/s. CEC specified white, custom engraved jewels to provide double visual impact.

Series 21000 "Multi-Switches" offer design engineers an unlimited choice of switch functions including interlock, non-lock, all-lock, push-to-lock, push-to-release and any combination of these. A modern square button, with concave face, provides positive feel and a choice of two lamp voltages—6 and 28 volts—is available. Up to 16 PDT switching circuitry may be operated by each station.

For more information on Series 21000 "Multi-Switches," write for Catalog No. S-306.

AUTOMATION IN WAREHOUSING MADE POSSIBLE BY STORERACK CRANE

Automation, in many shapes and forms, has reached just about every progressive industry that exists today. It can be simple or so vast and complex as to stagger the imagination.

One area in which automation is proving to be of definite benefit in delivering greater value at lower cost is in the warehousing and storage of parts and finished products that every manufacturer must contend with. For instance, by properly setting up storage cribs and installing an automatic stacking system, any item can be put into or removed from stock with a minimum of time and effort.

The Storerack Commuter Stacker Crane is symbolic of the newest concepts in automatic warehousing. The Commuter has been designed for either automatic or semi-automatic operation. It is constructed as a top running crane with vertical stacker lift mechanism and powered forks operating in a left and/or right lateral direction. Any type of load, weighing up to two tons, which can be palletized or handled on a skid is suited for handling by the Commuter system.

The heart of the Commuter Stacker Crane is the control console which houses the switching facilities required by such



Simplicity and efficiency are two keynotes of the Storerack Stacker Crane shown in the above photo. To assist in reaching these goals, Storerack selected a total of six Series 22000 "Multi-Switch" arrays.

a sophisticated piece of equipment. Four ten station Series 22000 "Multi-Switches" and two eight station Series 22000 switches are used in the Commuter control panel. By depressing the correct buttons, the operator can direct the Com-

muter Crane to store or retrieve any item in a storage area. Each switch station is keyed to a particular storage bin, thus if the operator depresses buttons 2, 6 and 8, the crane will automatically proceed to the designated area.

The illuminated Series 22000 "Multi-Switches" are available in frames of 1 to 31 stations with all standard functions. A modern square button design provides both front and side illumination from either 6 or 28 volt lamps. Storerack specified white buttons, with black-filled engraved symbols to minimize operator confusion.

Since the Storerack Commuter Crane has been designed for operation by personnel who frequently wear heavy gloves, it was essential that the space between buttons was sufficient to prevent accidental actuation of more than one button at a time. The Series 22000 switch, with its three-quarter inch plunger centers, met this important requirement perfectly.

The Commuter control panel offers such versatility that when the need for expansion or modification of the existing facilities becomes essential, a new panel, complete with additional switch stations, can be plugged in to replace the out-moded panel.

Whatever your requirements are for switching, you'll find a big selection contained in Switchcraft "Multi-Switch" Catalog No. S-306 which can be obtained by writing to Switchcraft, Inc., 5555 North Elston Avenue, Chicago, Illinois 60630.